University of Gondar

College of Medicine and Health Sciences

Department of Internal Medicine

Atrial fibrillation: Predictors Among Patients with Chronic Rheumatic Valvular Heart Disease following at Cardiology Clinic of University of Gondar Hospital, North West Ethiopia

BY Alula Abebe, MD

Advisors:

Ermias Diro, MD

Associate Professor of Internal Medicine
University of Gondar

Desalew Mekonnen, MD

Associate Professor of Internal Medicine
University of Gondar

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List of Acronyms

AF	Atrial Fibrillation
AIDS	Acquired Immunodeficiency syndrome
AR	Aortic Regurgitation
AS	Aortic Stenosis
CKD	Chronic Kidney Disease
COPD	Chronic Obstructive Pulmonary disease
CRVHD	Chronic Rheumatic valvular Heart Disease
DM	Diabetes Mellitus
DR	Doctor
EKG	Electrocardiography
HIV	Human immunodeficiency Virus
LA	Left Atrial
MR	Mitral Regurgitation
MS	Mitral stenosis
RF	Rheumatic fever
RHD	Rheumatic Heart Disease
TR	Tricuspid Regurgitation
UoG	University of Gondar
UK	United Kingdom
WHO	World Health Organization

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Abstract

Introduction

Atrial fibrillation (AF) is one of the series consequences of rheumatic valvular heart disease (RHD) which can occur early in the course or decade later. The prevalence of rheumatic AF is less in developed countries but data from developing countries showed that AF is the commonest arrhythmia and associated with stenotic valve abnormalities and dilated left atria. AF is associated with higher rate of complication such as, thromboembolism, decreased cardiac output (stroke volume), progression of left ventricular dysfunction and heart failure. This study examines the pattern, commonly associated valve abnormalities and list other associated factors with AF.

Methods

For this particular study, medical records of 136 patients age above 15 years with rheumatic valvular heart disease(diagnosed by clinical and echocardiography) were retrieved. Documented atrial fibrillation (with EKG and/or clinically), a case-control retrospective observational study was made to evaluate the risk factros and predictors of AF in RHD patients.

Results

A total of 68 cases with equal proportion of control were assessed. The mean age (in year) was 27.4+/-9.3 and 26+/-10.9 in AF and no AF respectively. Female preponderance in both groups were 53(77.9%) in AF and 43(63.2%) in no AF was observed. the mean left atria (LA) dimensions are 57.7±12.8 (mm^2) in AF and 43.9±9.1 (mm^2) in no AF AOR (1.15(1.08-1.22)) (P<0.0001). The duration of heart disease (years) was identified to be 5.7±3.9 in AF and 3.9±2.9 in no AF groups AOR (1.23(1.01, 1.50)) (p<0.039).

Conclusion

Factors that increase risk of development of atrial fibrillation (AF) were mitral stenosis (MS), aortic stenosis (AS), dilated left atrium (LAD) and duration of rheumatic heart disease (RHD) and these factors more observed in females. Atrial fibrillation (AF) was common between mid-twenty to mid-thirty.

Atrial fibrillation increases the risk of hospitalization. The major indications were congestive heart failure (CHF) followed by thromboembolism (stroke/TIA account the majority)

Key words

Rheumatic heart disease (RHD), atrial fibrillation (AF), University of Gondar (UoG)

Introduction

Statement of the problem

Rheumatic fever (RF) is a nonsuppurative complications of Group A streptococcal pharyngitis due to a delayed immune response. Rheumatic heart disease (RHD) is an established valvular lesion occurs decades after repeated episodes of rheumatic carditis that is pan-carditis in nature and follows streptococcal sore throat in two weeks-time. While potentially all valves can be affected, the mitral and the aortic valves are predominantly affected. The valves became regurgitant in the early period but with healing and fibrosis, valular stenosis develops decades later. Once there is established valvular affection other complications will follow. One of the major complications is atrial fibrillation (AF). (1-3)

Although RF and RHD are rare in developed countries, they are still major public health problems among children and young adults in developing countries. The economic effects of the disability and premature death caused by these diseases are felt at both the individual and national levels through higher direct and indirect health-care costs.*(4-6)*

Recently echocardiography based survey in some developing countries have estimated prevalence of RHD is 3-10 times compared to the previous estimates based on the clinical examination alone. (4, 7)

Atrial fibrillation (AF) is the most common persistent cardiac arrhythmia. Generally non rheumatic atrial fibrillation is well studied in developed countries whereas rheumatic atrial fibrillation is not a big problem in the westerns. (7-9) But still the prevalence is higher in sub-Saharan Africa especially those with high incidence of RHD patients like Ethiopia. (10, 11)

AF is associated with increased rates of death, stroke and other thrombo-embolic events, heart failure and hospitalizations, degraded quality of life, reduced exercise capacity, and left ventricular (LV) dysfunction(12)Conditions associated with AF are also markers for global

cardiovascular risk and/or cardiac damage rather than simply causative factors.(4, 7)

Literature review

Different studies have shown different results regarding the patterns of atrial fibrillation in chronic rheumatic vavlular heart disease patients. A study in Turkey, Ankara shows the highest frequency of AF in RHD occurs in those with mitral stenosis, mitral regurgitation, and tricuspid regurgitation in combination. AF, while occurring in 29% of patients with isolated mitral stenosis and in 16% with isolated mitral regurgitation, is an infrequent finding (1%) in patients with aortic valvular disease. Left atrial diameter by univariate analysis, and age and left atrial diameter by multivariate analysis have been shown to be the most important parameters to determine the occurrence of AF in patients with RHD(12)

Most studies about AF in RHD are hospital based surveys and are not representative of the general prevalence in the community but this few hospital based publication shows that the rate of rheumatic AF still is higher especially in sub-Saharan Africa(Ethiopia). Generally reports from the developed countries very low compared with NonRheumatic AF. A report in Cameroon(13) shows that prevalence of AF is much higher compared with the developed countries because of combined risk factors(Rheumatic and NonRheumatic AF) and rheumatic account for 25.6%, also other reports in Uganda, cote d'ivoire, Ethiopia shows same thing. (14-17)

Basically AF have different risk factors, this study focused Rheumatic AF and its pattern with respect to different valve lesions. Although clinical scoring system for prediction of high risk patient to developed atrial fibrillation in RHD is not well established. Inaccessibility of appropriate Echo and appropriate ECG makes it difficult to know the real prevalence and to stratify high risk features. A study in Ankara, Turkey shows rheumatic mitral stenosis have strong predictor, left atrial diameter and age are important confounders. AF, while occurring in 29% of patients with isolated mitral stenosis and in 16% with isolated mitral regurgitation, is an infrequent finding (1%) in patients with aortic valvular disease done in 1996.(12)

A prospective, hospital based clinical registry in Soweto study, South Africa among 344 case of RHD presenting to cardiology clinic in 2006/7 calendar year AF was diagnosed in 34 cases(9.9%). The predominant valvular lesion (n = 204, 59%) was mitral regurgitation (MR), with 48

(14%) and 43 (13%) cases, respectively, having combination lesions of aortic plus MR and mixed mitral VHD. Impaired systolic function was found in 28/204 cases (14%) of predominant MR and in 23/126 cases (18%) with predominant aortic regurgitation.(18)

Another hospital base prospective pilot study, in Mulago hospital, Uganda among one hundred thirty patients AF prevalence is 13.9%. The majority of the patients presented with moderate-to-severe valvular disease. Pure mitral regurgitation was the commonest valvular disease (40.2%), followed by mitral regurgitation plus aortic regurgitation (29%). Mitral regurgitation plus aortic regurgitation plus mitral stenosis was found in 11% of patients. There was only one case involving the tricuspid valve.(15)

Clinical records of 136 cardiac patients with atrial fibrillation (AF) followed in the cardiac clinic of the Black Lion Hospital, to study the risk of embolization in AF patients. RHD was found in 66.3% and responsible for embolization in 65.6%. Also a prospective study in Gondar also shows AF found in 22.8% of RHD cases Frequently encountered valve lesions were combined mitral regurgitation and stenosis seen in 29 (25.4%), followed by pure mitral stenosis in 25 (21.9%) and mitral regurgitation in 21 (18.4%).(10, 11, 16)

A retrospective study in USA focusing on the interrelation of factors contributing to the risk of AF in patients with mitral stenosis, we examined a cardiac catheterization database of a series of 314 patients. Patients with AF were older, 53.4 +/- 6.1 years versus 51.7 +/- 7.2 years ($p = 0.03$), and had a lower cardiac index of 2.3±0.6 L/min/m^2 versus 2.6±0.7 L/min/m^2 ($p = 0.0002$), than patients in sinus rhythm at catheterization. The mitral valve area was significantly smaller in patients with AF than in patients in sinus rhythm, 1.2± 0.5 cm^2 versus 1.6±0.7 cm^2 as was mitral valve index. The pressure-AF association with the highest statistical significance was seen with mean right atrial pressure, 10.6 +/- 4.9 mm Hg versus 7.6 +/- 3.8 mm Hg (odds ratio 2.24; $p < 0.0001$). Other variables with significant positive associations by univariate analysis were pulmonary artery wedge pressure, pulmonary artery mean pressure, and pulmonary resistance. When stepwise logistic multiple regression analysis was performed, the results indicated that both severity of mitral stenosis and increased right atrial pressure were independently associated with AF in this population with mitral stenosis. After adjustment was performed for

these variables, age was not independently associated with AF.(1, 5, 8, 19)

Justification of the study

In Ethiopia, RHD is one of the common causes of cardiac illness among adolescents and young adults. However, there is scarcity of information on the pattern of AF among the RHD patients and associated co morbidities. On top AF, occur either as precipitant in heart failure or cause of stroke (especially stroke in young). There is scanty of publications, in Ethiopia, and all are local hospital-based studies. This clearly demonstrates the fact that, the prevalence of AF at community level is not yet known, which is attributed to the Lack of community-based studies. A record review in Black Lion Hospital shows that RHD is responsible for 66.3% of AF. In another study in Gondar, 20 years ago, AF present among 22.8% of RHD patient, commonest arrhythmia and the third common precipitating factor for heart failure (drug discontinuation and infection). Therefore, this study is aimed at describing the socio-demographic and clinical predictors of AF among RHD patients. The information will give a baseline data for the setting and invites for the next steps of research and intervention to improve the health status of such patients.(10, 11, 16)

Objectives of the study

General objectives

- To study the risk factors and predictors of atrial fibrillation in chronic rheumatic heart disease patients in cardiology follow up clinic in University of Gondar Hospital

Specific objectives

- To sort out associated risk factors for the development of atrial fibrillation and
- To identify the commonly associated types of valvular disease among atrial fibrillation

Materials and Methods

Study design and study area

Institutional based retrospective patients chart record analysis was done to assess the risk factors and predictors associated with atrial fibrillation among patients with chronic rheumatic valvular heart disease in cardiology clinic of University of Gondar Hospital, North West Ethiopia

A case-control study design selected with equal proportion on cases and controls (1:1) to study risk factors and predictors of atrial fibrillation (AF). Cases were all patients with atrial fibrillation and controls all patients without atrial fibrillation

Study period

From January 1st 2010- December 31st 2014

Inclusion and exclusion criteria

Inclusion criteria:

Patients were included in the study if there age is ≥15 years and echocardiographic/clinical diagnosis of RHD with or without electrocardiographic (EKG) evidence of atrial fibrillation (AF)

Exclusion criteria:

Excluding patients if they were nonrheumatic AF or
AF with normal echocardiography or age less than 15

Study variables

Dependent variables:

- Atrial fibrillation(AF) (yes or no)

Independent variables

- Socio demographic factors such as: age, sex, and address;
- Clinical: duration of heart disease, total number of hospital admission, CHF, and thromboembolism;
- Echocardiography parameters: left atrial dimension, mitral valve area, mitral stenosis, mitral regurgitation, aortic stenosis, aortic regurgitation, and tricuspid regurgitation; and
- Treatment: Benzanthin penicillin

Data collection and Statistical analysis

Data was collected using structured questionnaires. Data analysis was done using using EPI 7.1.4. Continuous variables were calculated as mean ± SD (range). Odds ratio calculated for the exposure in both case and control groups using logistic regression analysis.

Operational definition

Atrial fibrillation defined as absent/or fibrillation P wave with/without irregular RR interval

Chronic rheumatic valvular heart disease (CRVHD) defined according to World Heart Federation (WHF). (20)

2012 WHF criteria for echocardiographic diagnosis of RHD
Echocardiographic criteria for individuals aged ≤20 years Definite RHD (either A, B, C, or D): A) Pathological MR and at least two morphological features of RHD of the MV B) MS mean gradient ≥4 mmHg* C) Pathological AR and at least two morphological features of RHD of the AV‡ D) Borderline disease of both the AV and MV§
Borderline RHD (either A, B, or C): A) At least two morphological features of RHD of the MV without pathological MR or MS B) Pathological MR C) Pathological AR
Normal echocardiographic findings (all of A, B, C, and D): A) MR that does not meet all four Doppler echocardiographic criteria (physiological MR) B) AR that does not meet all four Doppler echocardiographic criteria (physiological AR) C) An isolated morphological feature of RHD of the MV (for example, valvular thickening) without any associated pathological stenosis or regurgitation D) Morphological feature of RHD of the AV (for example, valvular thickening) without any associated pathological stenosis or regurgitation
Echocardiographic criteria for individuals aged >20 years Definite RHD (either A, B, C, or D): A) Pathological MR and at least two morphological features of RHD of the MV B) MS mean gradient ≥4 mmHg* C) Pathological AR and at least two morphological features of RHD of the AV, only in individuals aged <35 years‡ D) Pathological AR and at least two morphological features of RHD of the MV

Ethical considerations

The proposal was submitted and approved for analysis by IRB of the college of medicine and health science, University of Gondar (UoG), on june 2014.

Results

About 68 cases with complete medical record, data and fulfill the inclusion criteria were reviewed with fixed proportion between cases (AF) and controls (no AF) and analysed accordingly. The mean ages were 27.4±9.3 with a range of 15-44 years and 26±10.9 (range 15-50) years in AF and no AF, respectively. Thirty (44.1%) patients in AF groups are in age range of 25-34 years, whereas 35 (51.5%) of the patients in no AF groups are in younger age range of 15-24 years. In terms of sex distribution, male represent 15 (22.1%) AF and 25 (36.8%) no AF. Their demographic and clinical characteristics and echocardiography characteristics are shown in Tables 1 and 2

The mean duration of RHD among AF groups were 5.7±3.9 and NonAF 3.9±2.9 years and only one patient in NonAF group had mechanical mitral valve. Total hospital admission is higher in AF groups and heart failure/cardiogenic shock being the commonest reason, followed by thromboembolism (stroke/TIA and peripheral ischemia). Other clinical risk factors for AF like hypertension, diabetes, CKD, HIV, dyslipidemia, COPD are not significant in both groups. (See Tables 1 and 2)

Structural mitral valve disease commonly seen valve disease in both groups, echocardiographic evidence of Mitral stenosis and mitral regurgitation were found in 45(66.2%) and 43(63.2%) of patients with AF, 23(33.8%) and 39(57.4%) no AF groups respectively. The mean areas for mitral valve were 17.8±12.4 mm^2 and 24.3±14.4 in AF and NonAF groups, respectively. Left Atrial dimension (mm) (mean±SD) was 57.7±12.8 and 43.9±9.1 in AF and no AF groups respectively. Left atrial dimension, degree of mitral stenosis and aortic stenosis were seen more in AF groups, where as aortic regurgitation are more seen in no AF groups.

Medication use, 61(89.7%) in AF and 56(82.4%) in no AF groups were on benzanthin penicillin monthly IM injections. Aspirin, Warfarin, Beta-blockers and digoxin prescription were much higher in AF groups but enalapril was more in NonAF groups 12(17.6%) vs. 5(7.8%) and diuretics were

comparable in both arms. Their medication prescription and outcome assessment see Table 3 below

Table 1 Demographic and clinical characteristics of patients with chronic rheumatic valvular heart disease with AF (n=68) and no AF (n=68)

Variable		Frequency, percentage	
		AF	Non AF
No of patients		68	68
Age range	15-24	18(26.5%)	35(51.5%)
	25-34	30(44.1%)	15(22.1%)
	35-44	16(23.5%)	11(16.2%)
	Above 45	4(5.9%)	7(10.3%)
Sex	Male	15(22.1%)	25(36.8%)
	Female	53(77.9%)	43(63.2%)
Area of residence	Urban	45(66.2%)	45(66.2%)
	Rural	23(33.8%)	23(33.8%)
Total number of hospital admissions	No admission	19(27.9%)	37(54.4%)
	1	25(36.8%)	25(36.8%)
	2	18(26.4%)	5(7.4%)
	3 or more	6(8.9%)	1(1.5%)
Reason for hospital admission	**CHF**	44(64.7%)	27(39.7%)
	Thromboembolism	6(8.8%)	3(4.4%)
Hypertension		0	2(3%)
HIV infection		1(1.5%)	1(1.5%)
Epilepsy		1(1.5%)	1(1.5%)
CKD		0	1(1.5%)
CHD/PDA		0	1(1.5%)
Smoking		0	0
Diabetes		0	0
COPD or Dyslipidemia		0	0

Table 2 Shows clinical and echocardiography characteristics of patients with chronic rheumatic valvular heart disease with AF(n=68) and no AF (n=68)

Variables	Mean+/-SD	
	AF(n=68)	NO AF(n=68)
Age (year)	27.4+/-9.3	26+/-10.9
Heart Disease Duration (years)	5.7+/-3.9	3.9+/-2.9
Left Atrial dimension (mm)	57.7+/- 12.8	43.9+/-9.1
MV area (mm2)	17.8+/- 12.4	24.3+/-14.4

Table 3 Echocardiographic characteristics and Medication prescription of patients with chronic rheumatic valvular heart disease with AF (n=68) and no AF(n=68)

Variables	Frequency, percentage	
	AF(n=68)	NO AF(n=68)
Mitral regurgitation(MR)	43(63.2%)	39(57.4%)
Aortic regurgitation(AR)	7(10.3%)	13(19.1%)
Tricuspid regurgitation(TR)	27(39.7%)	21(30.3%)
Pulmonary regurgitation(PR)	00	00
Mitral stenosis(MS)	45(66.2%)	29(42.6%)
Aortic stenosis(AS)	6(8.8%)	3(4.4%)
Tricuspid stenosis(TS)	00	00
Pulmonary stenosis(PS)	00	00
Beta blockers	24(37.5%)	9(13.2%)
Diuretics	60(93.8%)	55(80.9%)
Digoxin	36(56.3%)	10(14.7%)
Aspirin	31(45.6%)	2(3%)
Warfarin	11(17.2%)	3(4.45%)
Benzanthin penicillin	61(89.7%)	56(82.4%)
Enalaprin	5(7.8%)	12(17.6%)
Amiodarone	0	0
Calcium channel blockers	0	0
Stroke/TIA	6(8.8%)	2(3.0%)
Peripheral embolization	00(0%)	1(1.5%)
Open heart surgery	0	1(1.5%)
Catheter ablation	0	0

Table 4. Bivariate and multivariate logistic regression analysis of factors associated with atrial fibrillation, University of Gondar, Northwest Ethiopia

Variables		Atrial fibrillation		OR with 95% CI		P-value
		Yes	No	Crude(COR)	Adjusted(AOR)	
Sex	Male	15	25	0.49(0.23,1.03)	0.36(0.13,1.03)*	0.05*
	Female	53	43	1	1	
Mitral regurgitation(MR)	**Yes**	43	39	1.28(0.64,2.55)	2.68(0.86,8.36)	0.09
	No	25	29	1	1	
Aortic regurgitation(AR)	**Yes**	7	13	1	1	
	No	61	55	0.49(0.18-1.3)	0.10(0.01,0.7)*	0.019*
Tricuspid regurgitation(TR)	Yes	27	21	1.47(0.73,2.99)	0.72(0.26,1.99)	0.53
	No	41	47	1	1	
Mitral stenosis(MS)	Yes	45	29	2.63(1.31,5.27)*	4.22(3.99,4.78)*	0.04*
	No	23	39	1	1	
Aortic stenosis(AS)	Yes	6	3	2.10(0.50,8.75)	20.65(1.84,232.1)**	0.01**
	No	62	65	1	1	
Benzanthin penicillin	Yes	61	56	1.87(0.67,5.08)	3.04(0.78,11.76)	0.11
	No	7	12	1	1	

*= Statistically significant at P<0.05 and **= P<0.01

Variables	Atrial fibrillation		AOR	Pvalue
	Yes	No		
Heart Disease Duration(years)	5.7+/-3.9	3.9+/-2.9	1.23(1.01,1.50)*	0.039**
Left Atrial dimension (mm)	57.7+/- 12.8	43.9+/-9.1	1.15(1.08-1.22)**	0.00**
MV area(mm2)	17.8+/- 12.4	24.3+/-14.4	1.0(0.94,1.07)	0.96

*= Statistically significant at P<0.05 and **= P<0.01

Table (continued). Bivariate and multivariate logistic regression analysis of factors associated with atrial fibrillation, University of Gondar, Northwest Ethiopia

Variables		Atrial fibrillation(AF)		OR with 95% CI		P value
		Yes	No	COR	AOR	
Stroke/TIA	**Yes**	6	2	3.19(0.62,16.48)		0.96
	No	62	66	1	1	
Peripheral embolization	**Yes**	0	1	2.09(0.50,8.75)		0.96
	No	68	67	1	1	
Congestive heart failure CHF)	**Yes**	44	27	2.78(1.39,5.58)**	2.69(1.33-5.42)	0.0057**
	No	24	41			
Total number of admissions	Yes	49	31	2.33(1.47,3.69)**	3.49(1.38,8.79)	0.008**
	no	19	37	1	1	

*= Statistically significant at P<0.05 and **= P<0.01

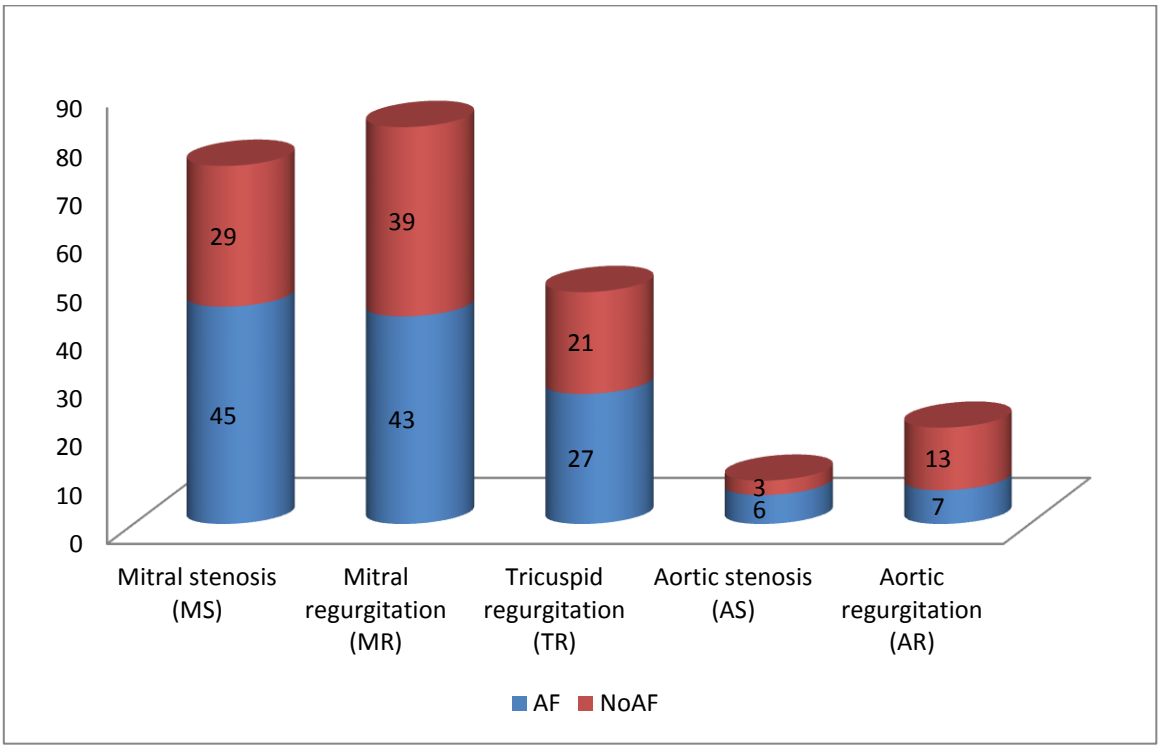
Discussion

In this study mitral stenosis (MS), aortic stenosis (AS) and dilated left atrial chamber increases the risk of development of atrial fibrillation (AF) among RHD patients. A hospital review in Turkey/Ankara shows highest frequency of AF in RHD occurs in those with mitral stenosis (MS), mitral regurgitation MR), and tricuspid regurgitation (TR) in combination. AF, while occurring in 29% of patients with isolated mitral stenosis and in 16% with isolated mitral regurgitation, is an infrequent finding (1%) in patients with aortic valvular disease. (12) A pilot study in Mulago Hospital showed that all patients with RHD presented with dilated atria (> 49 mm). (15) there are similarities between those studies LA size and MS increase risk of AF.

Commonly associated valve lesions were mitral stenosis (MS) and aortic stenosis (AS) statistically significant. Others like mitral regurgitation (MR) and tricuspid regurgitation (TR) almost always functional due to pulmonary venous hypertension were increase risk but not statistically significant. Aortic regurgitation (AR) no association seen. The possible explanations why stenotic valve lesions increase the risk were because of the duration of the disease and subsequent remodeling cardiac structure for atrial fibrillation (AF) development. These finding also supported by other studies were. (12, 15)

Another important finding was duration of rheumatic heart disease (RHD) increases the risk of development of atrial fibrillation (AF). There was no another study which compares this association previously. Female sex have higher rate of RHD and increased risk of development of AF a study in Cameroon(17), Turkey(12) and some sub-Saharan countries(13) showed increased rate of female patients with RHD and did not evaluate risk of development of AF among those patients. This is observed in this study too and the possible reasons were attributed to poor socioeconomic status, lack of women empowerment and financial dependency, lack of knowledge and awareness about health, and cultural beliefs.

Figure 1 the distribution of commonly associated rheumatic valve lesions in both AF and Non AF groups



Majorities of our patients with atrial fibrillation (AF) fall under age range (25-34) means between min-twenty and mid-thirty years of life, where as non AF RHD range of 15-24 years. This finding also supports the previously discussed finding about duration of RHD. (See fig 2),

The study also revealed that, atrial fibrillation (AF) significantly increase the risk of hospitalization among RHD patients and the major reason identified was congestive heart failure (with or without cardiogenic shock) and fewer cases of thromboembolic complication than expected but higher than the controls. This finding is in agreement with studies done in Ethiopia (11, 16),USA (1, 19) and Soweto (18). This is an indication that the finding is scientifically sound. When patients develop atrial fibrillation(AF) the cardiac output decreased by more than 30% of the baseline and those patients with underlying RHD already have compromised output, so these combined effect can cause deterioration of cardiac function and increase risk of CHF and thromboembolism.

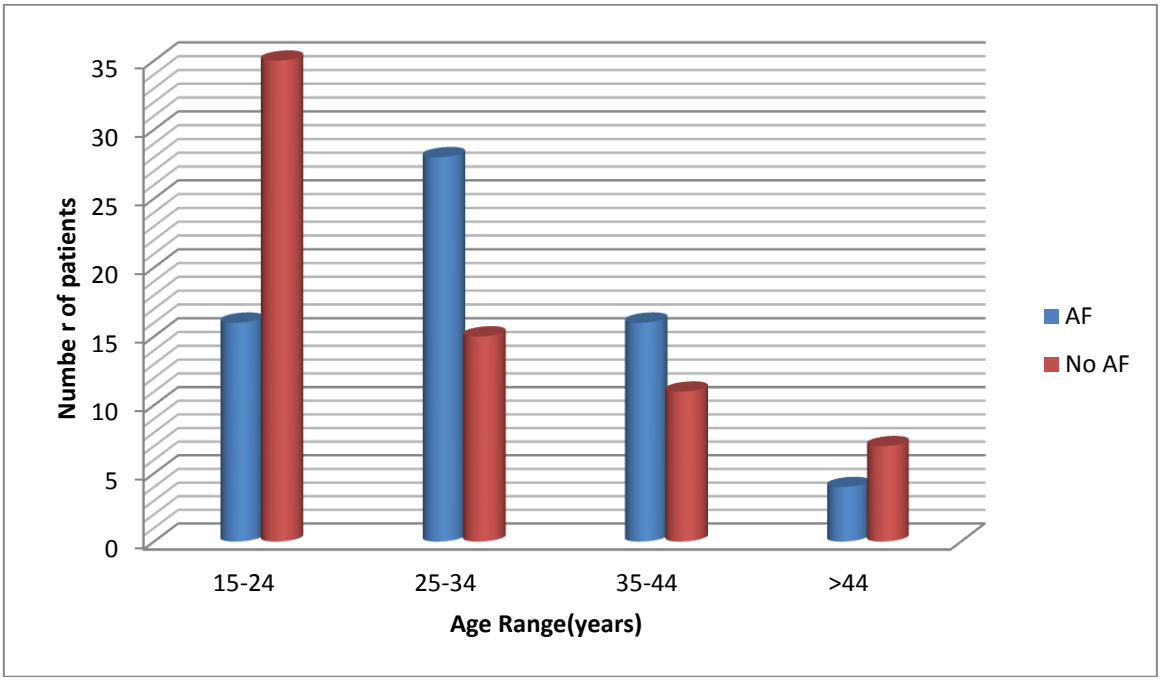


Figure 2 characteristics of age distribution in AF

Limitation and strength of the study

Limitation of the study

This study has some important limitations that should be kept in mind when interpreting the results. First, the case-control nature of the study design does not strongly correlate cause and effect relationships. This is single hospital base study, which limits the number of cases and controls. In some charts, absence of proper documentation has also resulted in insufficient data and increases the risks of bias and variables including appropriate echocardiography parameters were incomplete, that makes difficult to have a comprehensive analysis of risk factors. Furthermore, the study was based on documented chart review with the potential of selection bias and random error plus recall bias upon documentation.

Strength of the study of the study

Despite these limitations, a standardized questionnaire based data collection mechanism is developed for future related research activities.

Conclusion

The overall factors, which increase the risk of atrial fibrillation (AF) development, were mitral stenosis (MS), aortic stenosis (AS), dilated left atrium (LAD) and duration of rheumatic heart disease (RHD) and this factors more observed in females. Atrial fibrillation (AF) was common between mid-twenty to mid-thirty.

Atrial fibrillation increases the risk of hospitalization. The major indications were congestive heart failure (CHF) followed by thromboembolism (stroke/TIA account the majority)

Recommendations

For an inclusive nationwide concrete information on the topic. I recommend more research with different design in different part of country.

Screening protocol and scoring system development:

1. Duration of rheumatic heart disease: above or below 5.5 years
2. Left atrial dimension(mm): above or below 57mm
3. Severe aortic stenosis (AS): yes or no
4. Severe mitral stenosis (MS): yes or no
5. Female sex

Incorporation of other important parameters: socioeconomic status, benzanthin penicillin prophylaxis, echocardiographic evidence (flow rate and pressure gradient across high risk valve)

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Annex 1: **Questionnaires for investigating the Predictors among patients with chronic rheumatic valvular heart disease following at cardiology clinic of University of Gondar Hospital, North West Ethiopia**

1. Identification and epidemiologic data
   1.1. Card no…….

   1.2. Age (year) …….

   1.3. Age range (years)

   1.3.1. <15…… 1.3.2. 15-24….. 1.3.3. 25-34…….

   1.3.4. 35-44……. 1.3.5. >45……

   1.3. Sex: M….. F……

   1.4. Address: Urban…….. Rural…….

2. Clinical data

   2.1. Heart disease duration diagnosis (in year)…….

   2.2. Duration of Atrial fibrillation (in year)……

   2.3. Any valve surgery, If Yes (how many years since surgery)……..

   2.4. Other medical illness (yes/no)

   2.4.1. Hypertension…… 2.4.8. Congenital heart disease…….

   2.4.2. Diabetes…… 2.4.9. Ischemic heart disease……

   2.4.3. HIV infection…… 2.4.10. Kidney disease (CKD)……

   2.4.4. Dyslipidemia…… 2.4.11. Smoking (in pack years)……..

   2.4.5. Sleep apnea (OSAHS)……2.4.12. COPD……..

   2.4.6. Other tachyarrythmias……

   2.4.7. Waist circumference (in cm)

   2.5. Number of hospital admission ……..

2.6. Reason for hospital admission (if yes, indication)

A. CHF….. B. Shock …….. C. Thromboembolism……

3. Investigation

3.1. ECG (Atrial fibrillation) (yes/no) …….

3.1.1. Other finding specify……

3.2. Echocardiography

3.2.1. Stenotic lesion (yes/no) and if yes (mild, moderate, severe)

A. MS……B. AS…… C. PS…… D. TS……..

3.2.2. Regurgitant lesion (yes/no) if yes (mild. Moderate, severe)

A. MR……B. AR……..C. TR…… D. PR……

3.2.3. Valve area (in mm)

A. MVA…… B. AVA……..

3.2.4. LA dimension (in mm)……

3.2.5. Wall thickness (in mm)

A. Interventricular septum (IVS)……..

B. Posterior wall thickness (PWT)……..

3.2.6. Systolic function LVEF (in %) …….

3.2.7. Diastolic function (if yes, grade)

A. Mild …… B. Moderate……. C. Severe……..

4. Medication prescription (if yes, which one)

4.1. Beta blocker…… 4.6. Diuretics……..

4.2. Benzanthin penicillin…… 4.7. Digoxin……

4.3. Aspirin…… 4.8. Amiodarone……..

4.4. Warfarin……. 4.9. Other medication specify…….

4.5. Calcium channel blocker……

5. Surgical interventions (if yes)

    5.1. Catheter ablation …….

    5.2. Open surgery ……..

6. Any thromboembolic complication (if yes)…….

    If yes specify…….